

WARNINGS FROM OTHER DISTRICTS.

Chicago Forecast District.—The frequent movement of well-marked storms over the district continued during the month of April. The storms were unusual, both in frequency and in intensity, for the season of the year. They were accompanied by considerable precipitation and, as their tracks were well to the south, the temperature was for the most part considerably below the monthly normal.

The month opened with the passage of a severe storm over the southern and eastern portions of the district, and this was immediately succeeded by another which passed from the middle Rocky Mountain region directly eastward, taking an even more southerly course than its predecessor.

Both of these storms were accompanied by widespread precipitation and abnormally large snowfalls, many stations reporting amounts exceeding the previous April record. On the 4th and 5th several stations reported minimum temperatures, also breaking the April record.

At the beginning of the month vegetation had not developed sufficiently in the district to call for frost warnings, except in the more southerly sections. On the 1st advices for freezing temperatures were sent to Kansas and western Missouri, and on the 2d to the entire States of Kansas and Missouri, and warnings of frost to southern Illinois.

On the 3d a cold-wave warning was sent to southern Kansas, and on the morning of the 4th warnings of frost or freezing temperature to Missouri, Kansas, and extreme southern Illinois.

On the night of the 1st a warning of impending gale with squalls was phoned to local shipping interests on Lake Michigan, supplementing the general advisory message for the Lake issued from Washington. Another warning was issued to local shipping interests on the night of the 3d and the morning of the 4th.

On the morning of the 3d advices to live-stock interests were sent to the States of Kansas, Nebraska, and west Missouri, and special cold-wave warnings to southern Kansas. All these special forecasts for low temperature and stormy conditions were fully verified.

On the morning of the 10th another storm was apparently developing in the Plateau and Rocky Mountain regions promising a repetition of the severe conditions which prevailed the previous week. Advices to live-stock interests were immediately wired to points in the States of Wyoming, South Dakota, and the northern portions of Nebraska and Kansas, and these undoubtedly proved timely as the snow was heavy and the gales were strong from the north with falling temperature. On the night of the 10th warnings were issued to vessel interests on southern Lake Michigan in conformity with a message from Washington for strong easterly winds with rain or snow.

On the morning of the 11th cold-wave warnings were issued to Kansas and points in western Missouri, but these failed of verification, except in western Kansas, because of the unusually rapid movement eastward of the disturbance. At the same time heavy-snow warnings were issued for several points in the middle West, but the precipitation which was largely in the form of heavy snow in the Central Plains States was in the form of rain in the sections farther east. This storm took a course directly eastward over southern Missouri and the Ohio Valley.

On the morning of the 12th warnings for frost or freezing temperature were sent to the States of Illinois,

Missouri, Kansas, and Nebraska, and on the morning of the 13th warnings of frost to Illinois and eastern Missouri, and these were fully verified.

Another storm developed in the far West on the 15th-16th, and advices to live-stock interests were sent to Wyoming on the morning of the 16th and to Nebraska and Kansas on the morning of the 17th. Severe conditions also attended the movement of this storm and doubtless the warnings were quite timely.

Warnings of frost or freezing temperature were again sent to the States in the southern and central portions of this district on a few days during the balance of the month, and these were justified as shown by ensuing conditions.

Advices to live-stock interests were issued to points in Montana and Wyoming on the 28th, and to Wyoming and Nebraska on the 29th, in advance of falling temperature with northerly winds and rain turning to snow.

A special effort was made during the month to keep live-stock interests fully advised as to cold, wet weather, whether with snow or rain, because of the lambing and shearing season.—*H. J. Cox.*

Denver Forecast District.—The month was unusually cold in the northern and eastern parts of the district. Three storms of marked intensity crossed the district during the month. The first of these was followed by remarkably cold weather for the season on the eastern slope, and the loss of the fruit crop in the Pecos Valley in eastern New Mexico. The storm reached the Texas Panhandle on the morning of the 3d, with increasing intensity. Cold-wave warnings were issued for eastern New Mexico and much colder weather predicted for Colorado. Live-stock warnings were issued for eastern Colorado and northern New Mexico. The cold-wave warning was verified in eastern New Mexico, an unprecedented freeze occurring in the Pecos Valley. At Roswell the remarkably low temperature reading of 18° above zero was recorded and the temperatures in eastern Colorado ranged from zero to 10° above zero. The second storm crossed the district at the end of the first decade and resulted in freezing temperatures in a large area for which warnings had been issued. The storm that was central in southeastern Colorado on the morning of the 17th was unusually severe in eastern Colorado for the time of the season. The live-stock warnings issued for eastern Colorado on the morning of the 17th were timely as freezing temperatures and heavy snows covered nearly all of Colorado during the following 24 hours. Live-stock warnings were extended to cover eastern New Mexico on the evening of the 17th and the morning of the 18th, but the resulting weather conditions were not so severe in that State. Freezing temperature warnings were also issued for large areas on several other dates and were generally verified.—*Frederick W. Brist.*

New Orleans Forecast District.—Conditions were more intense than is usual during April. A number of barometric depressions, moving far southward before they turned to the east or northeast, passed over the district and were followed by short periods of unseasonably cold weather.

Northwest storm warnings were issued for the Texas coast on the morning of the 4th because of a disturbance that was passing eastward, followed by considerably higher pressure. The warnings were fully verified on the east coast of Texas but not on the west coast, and were ordered down at 8.30 p. m.

Unusually low barometer was charted over the west Gulf States on the 8 p. m. map of the 17th, the center of

the depression being over northern Texas. Southeast storm warnings were displayed on the Louisiana coast and southwest warnings on the east coast of Texas. As the disturbance tended to fill up and diminish in intensity, the warnings were not verified.

On the morning of the 26th an area of high pressure was advancing southeastward from the Rocky Mountain region and the Plains States, preceded by low pressure in the lower Mississippi Valley and on the Texas coast. Northwest storm warnings were ordered for the Texas coast and were verified.

Small-craft warnings were displayed on the Louisiana coast on the 1st, 4th, and 6th, and on the Texas coast on the 6th and 17th, and were justified.

No general storm occurred without warnings.

On April 1 and 2, a disturbance moved northeastward from the southern Plains States to the Lake region and was followed by frost in northern Texas as far east as Dallas, with freezing in northwestern Texas and Oklahoma. Warnings of frost or freezing temperature were issued 24 hours in advance of occurrence for the northwestern portion of the district, but for not quite all the area where frost occurred, the movement of the conditions being unusually rapid for the season.

On account of intense conditions on the morning of the 3d, when a disturbance overlaid the northwestern portion of the district, with a strong barometric gradient on the northern side, freezing was forecast for Oklahoma, the northern portion of west Texas, the northwestern portion of east Texas, and northern Arkansas. Midday special observations were obtained and a cold-wave warning was issued for the northwestern portion of the district. The warning was verified and freezing weather occurred as forecast. A minimum temperature of 13° was registered at Amarillo on the 4th.

Warning of frost in the interior of Louisiana and to the Texas coast except in the lower Rio Grande Valley, with freezing or lower in Oklahoma, northern Texas, Arkansas, and extreme northern Louisiana, was issued on the morning of the 4th. Conditions occurred generally as forecast. Frost was observed as far south as Houston, Tex., on the morning of the 5th, and the lowest temperature of record for the season occurred at Galveston, Tex., Shreveport, La., and in Arkansas.

On the morning of the 11th a deep depression was central over extreme southwestern Kansas and a moderate area of high pressure to the northward was moving south. Cold-wave warnings were issued for the northwestern portion of the district. The cold wave reached the Texas Panhandle on the morning of the 12th, but freezing did not extend over southern Oklahoma, and did not reach Bentonville, Ark., until the morning of the 13th.

Besides the warnings already mentioned, warnings of frost or freezing temperature in some portion of the district, in the northern portion as a rule, were issued on

the 5th, 6th, 9th, 11th, 13th, 17th, 18th, 22d, 25th, 26th, 27th, and 30th, and nearly all were verified. Warnings to live-stock interests were issued on the 3d, 11th, and 17th for the northwestern portion of the district.

Fire-weather warnings for the forest reserves of Oklahoma and Arkansas were issued on the 3d, 14th, 17th, and 21st, and were fully justified, the wind and weather occurring as predicted in nearly every particular.—*R. A. Dyke.*

San Francisco Forecast District.—No severe storms occurred in this district during April. Sufficient rain fell for present needs, though the amount was below normal in California and the greater part of Nevada. In the North Pacific States it was heavier than usual and in the lower Columbia River Valley the excess amounted to more than an inch.

There were two wet spells in California and Nevada, both of which covered a period of about three days. The first began on the 8th and was caused by a low over western Oregon that moved southeastward. The second, beginning on the 13th, was from a low over British Columbia that moved south to Nevada, where it developed sufficient intensity to cause well distributed showers in the southern portion of the district.

During these two wet spells a large amount of snow was deposited in the northern Sierra Nevada Mountains. This was just what was needed to improve the water supply for irrigation and power purposes, as before it fell the snowfall was far below normal and even now it is considered insufficient for all requirements during the latter part of the summer.

After the showery period near the middle of the month, the weather in this district was controlled by the North Pacific high, which was most in evidence along the coast north of Eureka, Calif. Near the close of April a low from British Columbia moved south to Nevada, but it did not develop sufficient energy to cause any precipitation of consequence in the southern portion of the district.

Storm warnings were issued on the 2d and 3d for the North Pacific coast, and quite frequently between the 8th and 19th along the north California coast for winds that were more local than general in character. Small-craft warnings were displayed at San Francisco on the 15th. It is thought the storm warnings were timely and of benefit to mariners.

During the forepart of the month frost warnings were issued for the interior of northern California on several occasions, and during the latter half they were issued quite frequently for different localities in the North Pacific States. It is believed they were all justified and that no damaging frosts occurred without warnings.

Live-stock warnings for cold rains, with snow in the mountains, were distributed to stockmen on the 19th and 29th, both of which it is believed were fully verified.—*E. A. Beals.*

RIVERS AND FLOODS, APRIL, 1920.

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[Weather Bureau, Washington, June 2, 1920.]

FLOODS, APRIL, 1920.

This report deals with floods which began in March and continued into April. (See this REVIEW 48: 176-178.)

Floods in New England.—The melting of the heavy snow cover in New England in connection with the current precipitation of the month produced high water of

more than the usual duration. The Connecticut at Hartford was above flood stage from the 1st to the 9th and again from the 14th to the 21st, and finally from the 22d until the close of the month. The Merrimac reached a stage of 21.68, the highest since 1902.

Frequent light floods in the rivers of the Carolinas served to prolong high water in the lower reaches